Space Weather Technical Forecast

Issued on Sunday, 14 August 2022 at 00:19 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: Ongoing Active electron fluence.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Low over the past 24 hours, but with an increasing number of C-class flares during the period. There were two significant C-class flares, a C6.8 at 13/1732UTC and C6.7 at 13/1300UTC both from the region of 3079 (Dai/Beta-Gamma) in the southwestern quadrant. Otherwise activity has been around the C-class level, with eight sunspots on the visible disc. 3081 (Dai/Beta-Delta) has evolved rapidly in the northeastern quadrant, with 3076 (Dai/Beta) also presenting a notable flare risk. The remaining groups appear generally stable but benign. No Earth-directed CMEs were observed.

Solar Wind / Geomagnetic Activity: The solar wind, as measured by DSCOVR and ACE at L1, is showing a waning fast wind environment, with speeds declining to 500km/s and density declining to around average. The IMF was weak throughout with the north-south component varying weakly. The phi angle was mostly positive (away from the Sun), but with some negative variations. Geomagnetic activity was Quiet (Kp 0-2).

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV), as measured by GOES16, was at Background levels. The high energy electron flux (greater than 2 MeV) was high throughout, with a peak of 6.24e3 pfu at 13/1450 UTC. The 24-hour integrated electron fluence was above Active throughout, with a declining trend and with an observed value of 2.46e8 integrated pfu at 14/0000UTC.

Four-Day Space Weather Forecast Summary
Solar Activity: Solar activity is likely to be at Low levels, with a chance of being occasionally Moderate.

Solar Wind / Geomagnetic Activity: No Earth-directed CMEs feature in the current forecast. Earth is currently seeing a waning high speed stream from coronal holes 10 and 12. The next coronal hole 14 is due to connect on 17 August with speeds of 500km/s possible. Geomagnetic activity is expected to be mainly Quiet, with isolated Unsettled intervals through the next three days. Active intervals are possible on 17 August with a slight chance of G1/Minor Storms.

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV) is likely to remain at background levels, although with a slight chance of an S1 or greater event. High energy electron flux is expected to remain above the High (1e3 pfu) threshold through this period. Electron fluence is also expected to remain above the Active (1e8 integrated pfu) threshold throughout.

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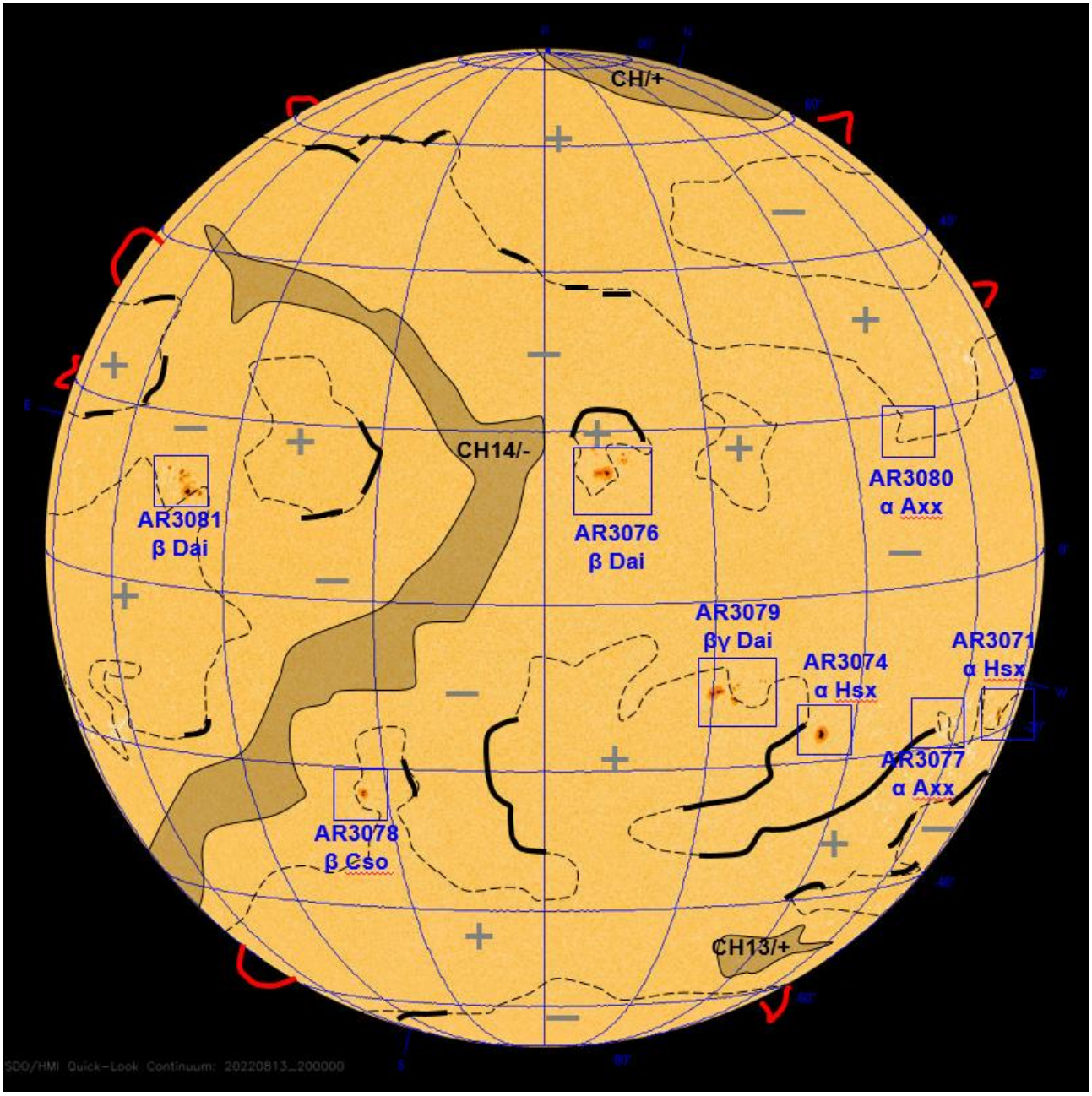
Figure 1. Solar Analysis Valid 13/2000 UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

No Earth-directed CMEs are in the current forecast.

Solar wind speeds are expected to continue to decline through the next three days due to the rotation of CH12 and CH10 across the western limb. Coronal hole 14 is then due to connect with the Earth during 17 August, based on a predicted high speed stream of 500km/s, based on the previous rotation, as the coronal hole is a recurrent feature.

Geomagnetic activity is expected to be mainly Quiet, with isolated Unsettled intervals through the next three days. Active intervals are possible due to the onset of the high speed stream from coronal hole 14, with a slight chance of G1/Minor Storms, based on persistence forecasts.

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	1	1	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Figure 2: L1/DSCOVR observation of solar wind and magnetic field.

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Radio Blackouts - X-Ray Flares:

Solar activity is currently Low, with an increasingly consistent baseline of C-class flaring. 3081 (Dai/Beta-Delta) has developed significantly in configuration and magnetic complexity over the last 24 hours and presents the most significant flare risk. 3076 (Dai/Beta) and 3079 (Dai/Beta-Gamma) also exhibit a heightened risk, with the remaining regions generally benign.

Activity is forecast to be mainly Low, but with a chance of Moderate flares and a very slight chance of X-class activity.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	30	30	30	30
Very Active	R3 to R5 X Class	No	2	2	2	2

Figure 3: GOES-16 X-ray flux

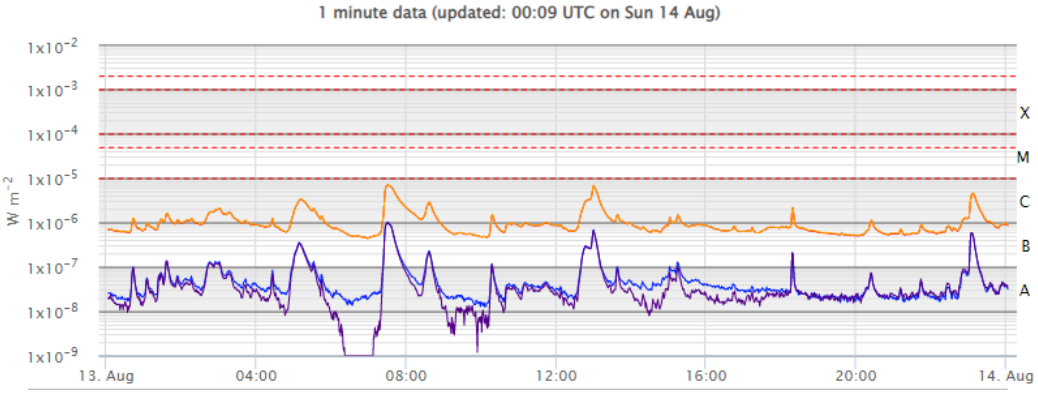
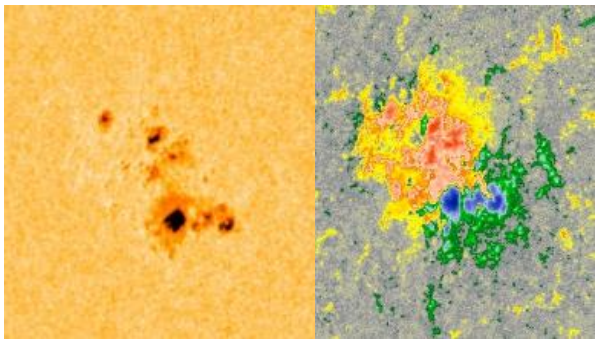


Figure 4: AR3081 (Dai/Beta-Delta) in the northeast quadrant



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Solar Radiation Storms - (High Energy Protons):

The high energy proton flux (greater than 10 MeV) is currently at Background levels, and is likely to remain at this level through the period.

Both AR3076 and AR3079 have a very slight risk of proton events and are now in the western hemisphere. The increase in complexity of AR3081 is one to watch, although this is currently in the eastern disc. There is a slightly increasing risk of S1 or greater in the four days, mainly due to AR3081 moving towards centre disc.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	5	5	5	5
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

High Energy Electrons Event (≥ 2MeV):

High energy electron flux (greater than 2MeV) is expected to be at high levels throughout the next four days, with only a brief dip possible due to the onset of the next high speed stream from coronal hole 14.

Electron fluence values are expected to remain above the Active threshold throughout, in the absence of any modifying factors from geomagnetic activity.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	Yes	100	90	90	80
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

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Figure 5: GOES 16 electron flux and MOSWOC REFM model

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